TABLE OF CONTENTS

DYNAMICS OF THE WATER AND NUTRIENT RESOURCE

Invited paper

Water and forest productivity
H.L. Gholz, K.C. Ewel and R.O. Teskey (U.S.A.) 1

Voluntary paper

Nitrogen mineralization along an altitudinal gradient: interactions of soil temperature, moisture, and substrate quality
R.F. Powers (U.S.A.) 19
Effects of water availability and fertilization on nitrogen cycling in a stand of *Pinus radiata*
R.J. Raison, P.K. Khanna, M.J. Connell and R.A. Falkiner (Australia) 31
Boron nutrition of *Pinus radiata* in relation to soil development and management
M.J. Lambert and P.J. Ryan (Australia) 45
Effects of intensive harvesting on nutrient capitals of three forest types in New England
J.W. Hornbeck, C.T. Smith, C.W. Martin, L.M. Tritton and R.S. Pierce (U.S.A.) 55
Partitioning of rainwater and chemicals into throughfall and stemflow in different forest stands
M.K. Mahendrappa (Canada) 65
Interactions between moisture, nutrients and growth of white spruce in interior Alaska
J. Yarie, K. van Cleve and R. Schlentner (U.S.A.) 73

TREE RESPONSES TO WATER AND NUTRIENT DYNAMICS

Invited paper

Water and nutrient dynamics and tree growth
R. Sands and D.R. Mulligan (Australia) 91

Voluntary papers

Drought tolerance and rainforest tree growth on a north Queensland rainfall gradient
G.L. Unwin and P.E. Kriedemann (Australia) 113
Growth analysis of responses by planted white pine and white spruce to changes in soil temperature, fertility, and brush competition
D.G. Brand (Canada) 125
Does water-stress lead to formation of traumatic tissue and tracheid collapse in poorly lignified *Pinus radiata*?
G. Downes and N.D. Turvey (Australia) 139
Dry-matter partitioning in loblolly and slash pine: Effects of fertilization and irrigation
J.D. Johnson (U.S.A.) 147

GENOTYPIC DIFFERENCES IN RESPONSE TO WATER AND NUTRIENTS

Invited paper

Utility of genotype×environment interactions
A.C. Matheson and P.P. Cotterill (Australia) 159

TABLE OF CONTENTS

DYNAMICS OF THE WATER AND NUTRIENT RESOURCE

Invited paper

Water and forest productivity
H.L. Gholz, K.C. Ewel and R.O. Teskey (U.S.A.) 1

Voluntary paper

Nitrogen mineralization along an altitudinal gradient: interactions of soil temperature, moisture, and substrate quality
R.F. Powers (U.S.A.) 19
Effects of water availability and fertilization on nitrogen cycling in a stand of *Pinus radiata*
R.J. Raison, P.K. Khanna, M.J. Connell and R.A. Falkiner (Australia) 31
Boron nutrition of *Pinus radiata* in relation to soil development and management
M.J. Lambert and P.J. Ryan (Australia) 45
Effects of intensive harvesting on nutrient capitals of three forest types in New England
J.W. Hornbeck, C.T. Smith, C.W. Martin, L.M. Tritton and R.S. Pierce (U.S.A.) 55
Partitioning of rainwater and chemicals into throughfall and stemflow in different forest stands
M.K. Mahendrappa (Canada) 65
Interactions between moisture, nutrients and growth of white spruce in interior Alaska
J. Yarie, K. van Cleve and R. Schlentner (U.S.A.) 73

TREE RESPONSES TO WATER AND NUTRIENT DYNAMICS

Invited paper

Water and nutrient dynamics and tree growth
R. Sands and D.R. Mulligan (Australia) 91

Voluntary papers

Drought tolerance and rainforest tree growth on a north Queensland rainfall gradient
G.L. Unwin and P.E. Kriedemann (Australia) 113
Growth analysis of responses by planted white pine and white spruce to changes in soil temperature, fertility, and brush competition
D.G. Brand (Canada) 125
Does water-stress lead to formation of traumatic tissue and tracheid collapse in poorly lignified *Pinus radiata*?
G. Downes and N.D. Turvey (Australia) 139
Dry-matter partitioning in loblolly and slash pine: Effects of fertilization and irrigation
J.D. Johnson (U.S.A.) 147

GENOTYPIC DIFFERENCES IN RESPONSE TO WATER AND NUTRIENTS

Invited paper

Utility of genotype×environment interactions
A.C. Matheson and P.P. Cotterill (Australia) 159

Voluntary papers

Influence of phosphorus deficiency on the growth response of four families of *Pinus radiata* seedlings to CO_2-enriched atmospheres
J.P. Conroy, P.J. Milham, D.I. Bevege and E.W.R. Barlow (Australia) 175
Effects of waterlogging on the growth and water relations of three *Pinus* taxa
M.J. Lewty (Australia) 189
Growth, biomass production and nutrient accumulation by seven tree species irrigated with municipal effluent at Wodonga, Australia
P. Hopmans, H.T.L. Stewart, D.W. Flinn and T.J. Hillman (Australia) 203

MANIPULATION OF THE SITE AND STAND FROM NURSERY TO CANOPY CLOSURE

Invited paper

Interplay between nutrients, water, root growth and productivity in young plantations
E.K.S. Nambiar (Australia) 213

Voluntary papers

Effects of tending practices on nutrient dynamics in a young stand of sugi (*Cryptomeria japonica*) and hinoki (*Chamaecyparis obtusa*)
K. Haibara and Y. Aiba (Japan) 233
Fertilizer/site interactions on the growth and foliar nutrient levels of *Eucalyptus grandis*
F.R. Herbert (South Africa) 247
Influence of fertilizer timing on seasonal nutrient uptake and dry-matter production by young *Pinus radiata* in southern Western Australia
J.F. McGrath and S.L. McArthur (Australia) 259
Importance of weed control, fertilization, irrigation and genetics in slash and loblolly pine early growth on poorly-drained Spodosols
D.G. Neary, D.L. Rockwood, N.B. Comerford, B.F. Swindel and T.E. Cooksey (U.S.A.) 271

MANIPULATION OF STANDS AFTER CANOPY CLOSURE

Invited paper

Nutrients, moisture and productivity of established forests
D.W. Cole, E.D. Ford (U.S.A.) and J. Turner (Australia) 283

Voluntary papers

Relationships between growing-season soil water-deficit, mineralizable soil nitrogen and site index of coastal Douglas fir
R.E. Carter and K. Klinka (Canada) 301
Growth responses by *Pinus radiata* to combinations of superphosphate, urea and thinning type
P. Snowdon and H.D. Waring (Australia) 313
Relative importance of water and nutrients on the growth of coast Douglas fir in the Pacific Northwest
S.P. Gessel, R.E. Miller and D.W. Cole (U.S.A.) 327

Forest decline, nutrient supply and diagnostic fertilization in southwestern Germany and in southern California
R.F. Huettl, S. Fink, H.J. Lutz (F.R.G.), M. Poth and J. Wisniewski (U.S.A.) 341
Nutrient accumulation and role of atmospheric deposition in coniferous stands
F.H. Braekke (Norway) 351

MODELLING THE EFFECTS OF WATER AND NUTRIENTS ON FOREST GROWTH

Invited papers

Modelling the interactions between moisture and nutrients in the control of forest growth
J.P. Kimmins, P.G. Comeau and W. Kurz (Canada) 361
Modelling the yield of *Pinus radiata* on a site limited by water and nitrogen
R.E. McMurtrie, (Australia) D.A. Rook and F.M. Kelliher (New Zealand) 381

Voluntary papers

Water/nutrient interactions affecting the productivity of stands of *Pinus radiata*
R.E. McMurtrie, M.L. Benson, S. Linder, S.W. Running, T. Talsma, W.J.B. Crane and B.J. Myers (Australia) 415

OPERATIONAL SYSTEMS: THEIR STATUS AND OPPORTUNITIES

Invited papers

Management of water and nutrient relations in European forests
H.G. Miller (Great Britain) 425
Manipulation of water and nutrients — practice and opportunity in southern U.S. pine forests
H.L. Allen, P.M. Dougherty and R.G. Campbell (U.S.A.) 437
Effects of water, nutrients and their interactions on tree growth, and plantation forest management practices in Australia: A review
D.B. Boomsma (Australia) and I.R. Hunter (New Zealand) 455

Author Index 477

Subject Index 481